Radiation Safety Information Bulletin

TACOM-Rock Island SAFETY OFFICE

Issue 01-04

July 2001

Special points of interest:

- **What to do if you have a broken tritium level vial.**
- **RSO Conference 2001 has been cancelled.**
- **How to respond in case of a RAD accident or incident.**
- **Is your humidifier use in compliance with CFRs ?**
- **Are you familiar with the Gray and the Sievert ?**
- **Training is our best tool for compliance with Fed Regs.**

Inside this issue:

Oops, I Broke the Level Vial !

It happens now and again. Sometimes panic ensues as the odd smell wafts into the nostrils of a gun crew or maintenance technician. A tritium illuminated fire control level vial has broken and we have a crisis - right? That liquid that is running down your arm and the vapor getting in your nose and mouth is tritium - right?

That liquid running down your arm and the vapor getting in your nose is tritium right? … That stuff is good old rubbing alcohol.

You are now getting irradiated and future generations are at stake - Right?
The answer is probably not. Level vials are fairly easy to break.

Level vials are exposed to shocks and rocks and anything else that might be flying through the air. That is the bad news. The good news is that tritium is not in the vial with the leveling bubble. That stuff is 100% good old rubbing alcohol (Isopropyl). The bulb containing the tritium gas is nestled down below the alcohol vial where it is surrounded on three sides by the metal frame of the assembly and is relatively safe from most impacts.

Place the device in a darkened location for about 2 hours...If no illumination is seen, the tritium lamp could be broken. A wipe test could be performed to confirm this...

Quite often a level vial will break and the alcohol will leak out or evaporate while the tritium light bulb has remained intact and will still glow in an illumination test. Lamps that illuminate level vial assemblies typically have an activity of 0.075 curies. This is fairly low activity as fire control lights go.

In most cases, we have found, a broken level vial will not result in significant contamination.

Now does that mean you ought to just blow off a report of a broken level vial. Nope. We are still obligated under the law to ensure and document that a worker's exposure

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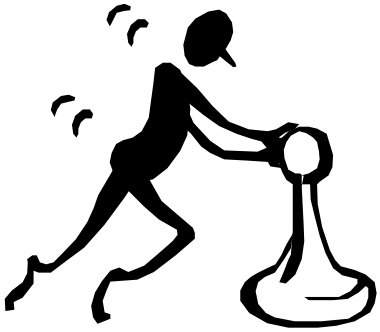
Oops, I Broke the Level Vial ! (continued)

(Continued from page 1)

to radioactivity is kept as low as reasonably achievable (ALARA). Isolate the device with the broken level vial assembly by enclosing it in two plastic bags preferably clear. Place the device in a darkened location for about 2 hours to let the phosphor discharge any energy it may be picking up from daylight and then check through the bags for illumination. If no illumination is seen, the tritium lamp could possibly be broken. A wipe test survey can be performed to confirm this.

In most cases we have found, a broken level vial will not result in significant contamination. If that is borne out by the wipe test, the damaged level vial assembly can be replaced according to the appropriate technical manual for the device and the device can be placed back in service.



...if the alcohol vial breaks, don't panic. There is no reason to round up everyone on the range and troop them off to the medical clinic for bioassays...

The damaged level vial assembly must be controlled for proper disposal because of the tritium lamp. Tritium lamps in Fire control level vial assemblies have only a few millicuries of activity and the lamps themselves are fairly well protected. In view of this if the alcohol vial breaks, don't panic. There is no reason to round up everyone on the range and troop them off to the medical clinic for bioassays, as some have tended to do. The prudent thing to do is wait for the illumination test and the wipe test results and then determine if bioassays are necessary. If a bioassay appears to be warranted because there was contamination, send the person closest to the source when it broke.

RSO Conference 2001 has been Cancelled

While the support for the conference was good, the current funding situation has forced us to cancel RSO conference 2001.

...we look forward to seeing all of you next year… start making plans to attend next year's conference.

The RSO Conference 2001 has been cancelled. While the support for the conference was good, the current funding situation has forced us to cancel the RSO Conference. We apologize to the many of you who had made plans to attend, and we look forward to seeing all of you next year. We suggest that you start making plans to attend next year's Conference (RSO Conference 2002). We anticipate the best conference ever. Any comments or suggestions for next year's conference are welcomed.

You may keep abreast of the latest news and information on the conference website: http://www-acala1.ria.army.mil/LC/R/RS/conf.htm. If you have any questions or comments, please contact: Vern Vondera at DSN 793-1690 or e-mail vonderav@ria.army.mil.

Radiation Accident or Incident Response

In this article my goal is to let you know about some of the causes of Radioactive accidents or incidents. As well as address what actions can be taken to prevent and/or lower the probability of accident or incident occurrence.

Most Low-level Rad incidents that occur with TACOM-RI commodities fall into one of three categories: (1) lost, stolen or missing radioactive material; (2) unexpected releases that cause contamination; or (3) hot wipe tests.

The three primary causes of Radiation Incidents are human error, environmental factors, and poor procedures. Poor procedures can involve SOPs, maintenance procedures, design flaws, inadequate facilities, and equipment.

The three primary causes of Radiation Accidents or Incidents are human error, environmental factors, and poor procedures.

It is important to know and understand the appropriate actions to be taken in the event of an incident involving radioactive material. The primary concern must always be the human well being, then limiting the exposure to personnel (ALARA), and stopping the spread of contamination. To ensure exposure is kept ALARA, remember the principles of time, distance and shielding when dealing with radioactive materials. If an individual is not trained in incident response procedures, fear, panic, doubt, & confusion can result. Individuals must be provided with the right information in order for them to respond effectively. We cannot eliminate accidents or incidents all together. However, with some effort, we can reduce the probability and severity, if and when they occur. All Safety programs should be actively involved in providing the following information to anyone having anything to do with Radioactive materials:

To ensure exposure is kept ALARA, remember the principles of time, distance and shielding when dealing with radioactive materials.

- Training in all aspects of Radiation Safety (with necessary equipment)
- Establish communication system (chain of command)
- Periodic review of techniques, SOPs, equip., and operations
- Review all new proposals, techniques, and equipment
- Up-to-date list of agencies which could provide assistance
- Pre-planning in facility design
- Evacuation plans
- Clear-cut organizational responsibilities
- Countermeasures to prevent large scale contamination
- Decontamination guidelines and equipment
- Disposal procedures

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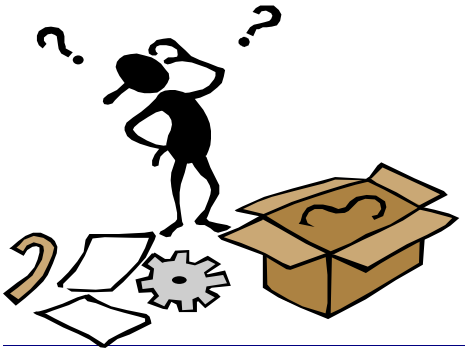
We cannot eliminate accidents or incidents completely. What we can do is to greatly reduce the probability of them happening; and the impact, damage, or contamination caused by the accident or incident by doing the above mentioned things.



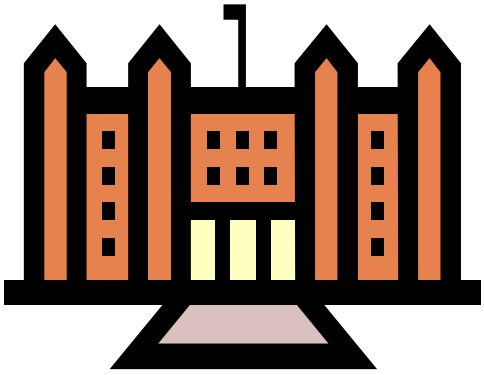
If an individual is not trained in accident or incident response procedures, fear, panic, doubt, and confusion can result… must be provided with the right information in order for them to respond effectively.

Using Dehumidifiers: The Next Tritium Issue

Have you ever read the front page of a "Department of the Army" Nuclear Regulatory Commission license (NRC)?
It is just that, a license issued to the Department of the Army. The name and address after that is the agency or subordinate command tasked with administrating the license for the Department of the Army. One thing should be clear when we talk about the CECOM license, the SBCCOM license, the TACOM license, or even the TACOM-RI license; what we are really talking about is a

The Army uses dehumidifiers in areas where the environment is detrimental to the longevity of the equipment. Humidity and time will always defeat metal... Small Arms and mortars are made with metal components and are stored in "Army rooms".

Department of the Army license for radioactive material in commodities. The Army has a mission and it has NRC licenses to facilitate that mission. The agencies that manage the licenses must find a way to allow the Army to use, maintain and store its equipment IAW the rules and regulations of radioactive material use.
The Army uses dehumidifiers in areas where the environment is detrimental to the longevity of the equipment. Humidity and time will always defeat metal; without a little help. Small arms and mortars are made with metal components and are stored in "Arms Rooms". Mortars have sighting



devices associated with them that contain licensed Tritium: radioactive Hydrogen. But why all the hubbub? Everyone knows that water is H2O: 2 Hydrogen atoms and 1 Oxygen atom. TACOM-RI users are also aware that Tritium is radioactive Hydrogen. The same chemical formula for water can give us Tritiated water: T2O, TOH.
When water vapor is removed from the ambient air, and when that same airspace houses commodities containing Tritium, it is probable that the residual water will contain some Tritium. The Army needs to use dehumidifiers to protect its equipment, so the mission of the TACOM-RI Safety Office is to find a way for the Army to use them that is within

Code of Federal Regulations. Proving that the amount of Tritium contained in the residual water (effluent) is below regulatory limits for Tritium content now becomes the issue.
Generally speaking, exposure to the amount of soluble Tritium available in commodities is not a substantial biological risk; however, those same amounts could well exceed the federal release limits. There in lays the danger to Army operations. Demonstrating that the release limits have not been exceeded now becomes the last hurdle for full compliance

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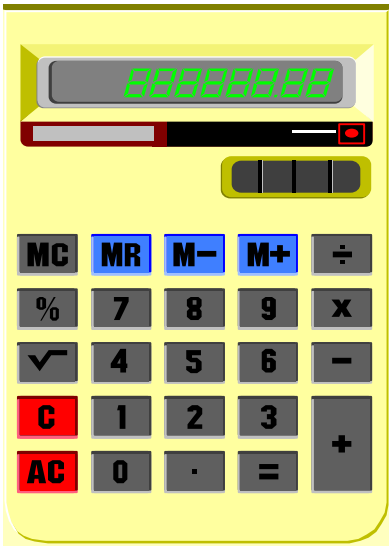
with federal law. The TACOM-RI Safety Office will soon publish a policy memorandum on its website detailing sampling and program procedures. These instructions are applicable to Units and Organizations that have Fire Control Devices stored in areas where dehumidifiers are in use. The procedures are provided to ensure compliance with federal release limits. The Installation RSO will ensure state and local regulatory compliance.
The TACOM-RI Radiation Safety page: http://www-acala1.ria.army.mil/LC/R/RS/rad-safe.htm

Grays and Sieverts Soon To Be

The use of the "old" terms we have become so familiar with to describe radiation quantities and units are slowly being replaced by "new" terms. In 1975, the 15th General Conference on Weights and Measurements adopted some new names for certain basic units used in radiation protection. The new units are consistent with the metric system of units developed by the International Committee for Weights and Measurements.



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These "new" units are known as the System International (SI) units. Proposed rule changes to Title 10 and Title 49 of the CFR are on the near horizon with a proposed implementation in October 2001. Be aware, these proposed changes will exclusively use the SI units and will affect all units, activities, installations, camps and posts that use, maintain, and store devices containing radioactive material.

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The change to SI units has far reaching implications! How will this affect you? In order for us to remain in compliance with both Federal and International regulatory statutes, we must become familiar with these "new" terms, and be able to convert from one to the other. For instance, radiological units on data plates and associated publications for the devices that contain radioactive material are in standard units. Some common carriers will not accept packaged shipments that have the standard units on either the labels or associated documentation. So… What better time than *NOW* to start becoming familiar with the System International units!

In order for us to remain in compliance … we must become familiar with these "new" terms, and be able to convert from one to the other ... So… What better time than NOW to start becoming familiar with the System International units!

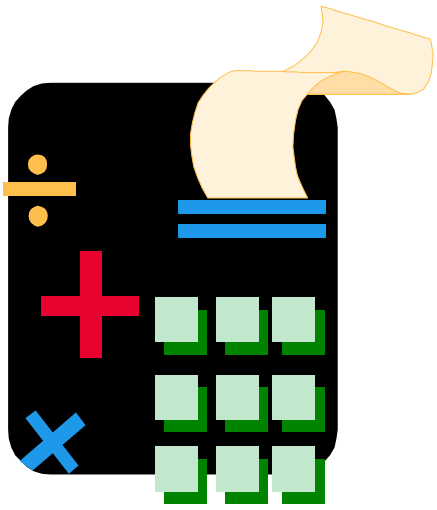
Here are some helpful conversions:

<u>Larger than the base units:</u>

Tera 1×10^{12} = 1,000,000,000,000
Giga 1×10^{9} = 1,000,000,000
Mega 1×10^{6} = 1,000,000
Kilo 1×10^{3} = 1,000

<u>Smaller than the base units:</u>

Centi 1×10^{-2} = 0.01
Milli 1×10^{-3} = 0.001
Micro 1×10^{-6} = 0.000001
Nano 1×10^{-9} = 0.000000001
Pico 1×10^{-12} = 0.000000000001



Grays and Sieverts Soon To Be (continued)

Gray Sievert	centiGy centiSv	milliGy milliSv	microGy microSv	rad rem	millirad millirem	microR microrem
100	10,000	100,000		10,000		
10	1,000	10,000		1,000	1,000,000	
5	500	5,000		500	500,000	
1	100	1,000	1,000,000	100	100,000	
0.1	10	100	100,000	10	10,000	
0.01	1	10	10,000	1	1,000	1,000,000
0.001	0.1	1	1,000	0.1	100	100,000
0.0001	0.01	0.1	100	0.01	10	10,000
0.00005	0.005	0.05	50	0.005	5	5,000
0.00001	0.001	0.01	10	0.001	1	1,000
	0.0001	0.001	1	0.0001	0.1	100
	0.00001	0.0001	0.1	0.00001	0.01	10
	0.000001	0.00001	0.01	0.000001	0.001	1

DIRECTIONS: Read across to convert from one unit to another.

EXAMPLE: Convert 15 rad to Gray
Go down the "rad/rem" column to 10 then read across left to the Gray column and find a conversion factor (in this case, 0.1). That means for every 10 rad there is 0.1 Gray. To convert, multiply the value you want to convert (15 rad) by this conversion factor (0.1) to obtain a converted number (1.5 Gray).

To check, reverse the process by going down the Gray column to the conversion factor of 0.1, then reading across under the rad column to the value of 10. Multiply the number of Gray (1.5 Gray) by the conversion factor found in the rad column (10) to obtain 15 rad.

ACTIVITY UNITS

Multiply the # of: To obtain the # of:	by by	To obtain the # of: Divide the # of:
Curies	3.7×10^{10}	Becquerels (Bq)
millicuries	3.7×10^{7}	Becquerels (Bq)
microcuries	3.7×10^{4}	Becquerels (Bq)

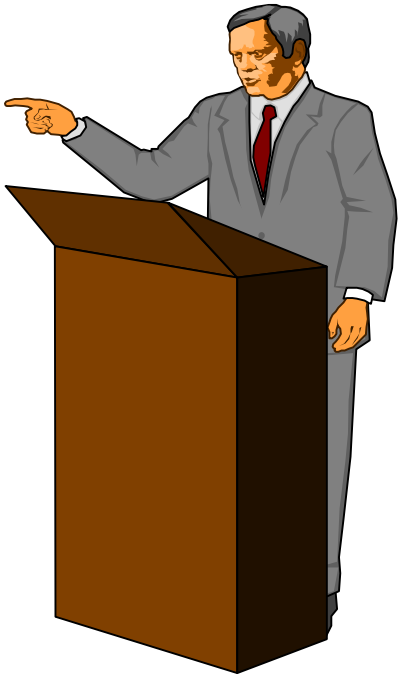
Multiply the # of:	by	then divide by:	To obtain the # of
Curies	3.7×10^{10}	1×10^{12}	Terabecquerel (TBq)
millicuries	3.7×10^{7}	1×10^{9}	Gigabecquerel (1GBq)
microcuries	3.7×10^{4}	1×10^{6}	Megabecquerel (1MBq)
nanocuries	3.7×10^{1}	1×10^{3}	Kilobecquerel (1KBq)

EXAMPLE: Convert 27 Curies to TBq.
27 Curies X 3.7×10^{10} dps/Ci = 9.99×10^{11} dps divided by 1×10^{12} dps/TBq = 0.999 TBq or 1 TBq

Radioactive Material Handling Safety Course

To train or not to train that is the question; whether it is the responsibility of the RSO or the Licensee to conduct! All right, we have all seen the William Shakespeare play, so I will spare you.

Training is clearly our best tool to keep everyone aware of their responsibilities while using or working with items that contain radioactive material. What is not always clear is who is responsible to ensure that the training is completed.



At the Installation level or state level for the National Guard, TDY expenses is a small price to pay for an excellent training program conducted by qualified, experienced instructors.

The other important item we must all remember is documentation. Training must be recorded and records kept at Installation RSO level for inspection. Remember, if you don't have records of training, the training was not done.

Training is clearly our best tool to keep everyone aware of their responsibilities while using or working with items that contain radioactive material. What is not always clear is who is responsible to ensure that the training is completed.

Army Regulation 11-9 states that it is the responsibility of the Installation RSO and the Commander to ensure that training is conducted.

The other item we must all remember is documentation. Training must be recorded and records kept at Installation RSO level for inspection. Remember if you don't have records of training, the training was not done.

NRC license 12-00722-06 issued to and managed by TACOM-RI states that all users and maintainers at all levels will receive initial radiation safety training and annual refresher training, thereafter.

It also states that unit commanders will be responsible for ensuring that the training is conducted, and records of the training are to be kept for inspection by installation RSO and the licensee. Army Regulation (AR 11-9) states that it is the responsibility of the Installation RSO and the Commander to ensure that training is conducted.

In the past, TACOM-RI has provided training as a free service, but due to budget shortfalls for fiscal year 01 and 02, we will be scaling back. The training course is still available, and we are willing and able to provide training for the cost of TDY expenses.

If you would like to schedule Rad Safety Training contact me, Wayne Cook at DSN 793-2429 or commercial (309) 782-2429 or E-mail cookw@ria.army.mil

TACOM-Rock Island Safety Office

Chief, Safety Office
Vernon Vondera, DSN 793-1690, vonderav@ria.army.mil
Commercial (309) 782-1690

Health Physicists
Jeff Havenner, DSN 793-2965, havennerj@ria.army.mil
Tim Mohs, DSN 793-6228, mohst@ria.army.mil
Gavin Ziegler, DSN 793-2995, zieglerg@ria.army.mil
Commercial (309) 782-2965/6228/2995

Trainers
Wayne Cook, DSN 793-2429, cookw@ria.army.mil
Ignacio Nevarez, DSN 793-0265, nevarezi@ria.army.mil
Commercial (309) 782-2429/0265

Logistician
Cindy Ackerman, DSN 793-0861, ackermanc@ria.army.mil
Commercial (309) 782-0861

Contractor Staff
Kenneth Baugh, Health Physicist, baughk@ria.army.mil
DSN 793-5979, Commercial (309) 782-5979
Florentino "Dante" Laciste, Jr., Trainer, lacistef@ria.army.mil
DSN 793-6020, Commercial (309) 782-5979/6020

Safety Office Address/Fax/Email
Commander
U.S. ARMY Tank-automotive and Armaments Command
ATTN: AMSTA-LC-SF
1 Rock Island Arsenal
Rock Island, IL 61299-7630
DSN: 793-6499; Commercial (309)782-6499
FAX DSN 793-6758; Commercial (309) 782-6758
E-mail: amsta-lc-sf@ria.army.mil

Visit us on the web!
http://www-acala1.ria.army.mil/LC/R/RS/safe.htm